tifunction keypad includes a touch-sensitive surface **10** upon which are defined a plurality of regions designated as keys. Associated with surface **10** is a processor **12** (seen in **FIGS. 13A and 13B**). Processor **12** is configured to: (i) identify a contact location at which an object comes into contact with the touch-sensitive surface, (ii) determine a selected one of the keys corresponding to the one of the regions within which the contact location is located, (iii) identify a path of motion of the object across the touch-sensitive surface relative to the contact location, and (iv) select, in a manner conditional upon at least one parameter of the path of motion one of a plurality of functions associated with the selected key. Most preferably, the primary parameter used in the selection of the function is the direction of motion of the path.

[**0049**] It will be immediately apparent that the present invention provides profound advantages over the aforementioned data input devices. Specifically, by providing multi-function keys, the number of keys is reduced, and hence the area of each key can be increased. This permits finger operation of the keys. At the same time, the selection of function by detecting direction of motion subsequent to initial contact renders function selection quick and intuitive. Since the motion is evaluated relative to the location of initial contact, the location of initial contact within the key is unimportant. This reduces the precision of actuation required from the user to a level that finger-tip operation is reliable. This and other advantages of the present invention will become clearer from the following description.

[**0050**] As mentioned above, for basic alphanumeric data entry operation one typically requires 40 to 60 keys to be activated instantaneously. In typical touch screen used in mobile devices such a numbers of keys necessarily lead to very small key size that can not be activated accurately by tip of finger and even when using a stylus it takes considerable attention to direct the touch to the right place.

[**0051**] In the current invention 4-6 characters are typically grouped with one key. The number of keys on the screen may thus be reduced to 10-16 keys, where each key size is in the range of a tip of a finger size. Such size is well suitable for comfort key visual selection as well as finger operation. The current invention combines the advantageous features of a soft key keypad (e.g., its relative small typing error probability, dynamic layout and labeling) with the rich functionality gained by the ability of the touch screen to detect many types of activation motion on the key.

[**0052**] The preferred embodiments are suitable to be operated interchangeably by use of a stylus or directly by the user's finger, as preferred by the user.

[**0053**] Referring now specifically to **FIG. 1**. A touch screen **10** with width of approximately 3-4 cm and height of approximately 6-8 cm is shown. Typically such screen size is implemented on cellular phones device, like for example the Samsung I-MAX. The touch screen dimensions lead us to pick a 3×5 key matrix layout for the multi functional keypad. The number of keys and their shape can vary in different implementations. For example, in other preferred embodiments for PDA devices, like the Palm Pilot®, the typical size of square 6×6 cm is used and different layouts are appropriate in this case. In **FIGS. 4, 6** and **9**, three possible embodiments for square 6×6 cm touch screen are shown.

[**0054**] Referring back to **FIG. 1**, the touch screen **10** which is divided to two zones: the display zone **20** contains the result of the text entry and the soft keys zones contains 3×5 keys keypad. In the preferred case illustrated here, the keypad includes thirteen 4-way soft keys (e.g. keys **100**, **102** and **104**), one 3-way soft key **106** and one regular one function soft key **108**. The 4-way key function/characters activation is done by touching the key anywhere on the key area and then tilting or moving the finger to one off the following directions: up, down, left and right. In stylus operation, since the tip of the stylus is very narrow only move operations can be used. The character/function associated with each direction is preferably marked by a label on the key according to the direction. For example, the label **200** representing a comma text entry is associated with the move/tilt upwards when touching the key **100**, and the label **202** representing the letter 'G' is activated by touching the key **102** and move or tilt the finger or stylus towards the left. The label can be a character as in **204**, a number as in **46**, other text like symbols like the comma in **200**, any other graphic icon like the ENTER graphic symbol in **208** or a text abbreviation like the 'Send' label **210** in key **108**.

[**0055**] The activation of the key start by the act of touching in any point in the area on the key. The key contains labels (one or more) to imply the functions associated with the key. The associated function can be entering characters to the display **20** or applying a command function like the send operation in key **108**. The keys in the keypad can be a mix of regular one-function keys like key **108** with other multi function keys. In the case of one function a regular touch operation activate the function. In multi-function key the first touch on the key activate the key and the relative trace created by the movement or the tilt on the touch with respect to the initial touch point is selecting the appropriate function among the functions that associated with the selected key. In order to use the touch screen as a keypad a keypad controller entity should be exist on the device. This controller can read the coordinate of the touch operation on the touch screen and communicate with the device to transfer the selected character/function that have been selected. The keypad can be implemented by explicit dedicated hardware, or by firmware or software running on a processor. All such implementations are referred to generically in the description and claims as a processor configured to perform the recited functions.

[**0056**] In order to select the function activated by the user, the keypad controller calculates several zones when a touch on a key is detected. The zones created for the 4-way function key **102** in two situation of the place of the initial contact points on the key are shown in the **FIG. 2***a* and **FIG. 2***b*. In **FIG. 2***a* the initial contact point **90** is in the center of the key and the four zones **300**, **302**, **304**, **306** are sectors created by four rays **400**, **402**, **404**, **406** emerging from the initial contact point **90**. Typically in symmetrical 4-way multi-function key, each sector span will be 90 degree, but one may change it to enlarge or reduce the activation probability of some of the functions.

[**0057**] The zone **300**, which is associated with the letter 'H', is the area between rays **400** and **406**. Zone **302** associated with the letter 'I' is the area between rays **400** and **402**. Zone **304** associated with the number '4' is the area between rays **402** and **404**. Zone **306** associated with the letter 'G' is the area between rays **404** and **406**.